TESTIMONY OF

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Chairman Gilchrest, members of the Subcommittee on Fisheries Conservation, Wildlife and Oceans, and other participants, it is an honor to testify today on the topic of cooperative research. I want to thank the Subcommittee for providing me with the opportunity to encourage research cooperation among fishing people (both commercial and recreational), National Marine Fisheries Service scientists, and other scientists. I will testify based on my experience as the Director of the NOAA Fisheries, Northeast Fisheries Science Center. The Center's headquarters are located in Woods Hole, MA. It also has laboratories in Narragansett, RI; Milford, CT; Sandy Hook, NJ; and at the Smithsonian Institution in Washington, DC.

I will address four topics: (1) the history of cooperative research, (2) reasons why cooperative research is valuable, (3) examples of cooperative research, and (4) success factors for cooperative research.

History of Cooperative Research

In many ways, people who fished were the first fishery scientists. There is evidence of fishing in the prehistoric record of humans, as well as in the earliest recorded history, such as records from 6,000 years ago of Phoenicians trapping giant bluefin tuna. Fishing people are students of fish distributions, the factors that influence fish movements, and what fish eat. They learned long ago that there are cycles in the abundance of fish, and they correctly presumed that this reflected climate change.

There are key differences in the ways modern scientists and fishing people gather information about fish populations and marine ecosystems. Scientists make systematic observations in standardized ways, using statistical and mathematical models to interpret them. Additionally, they document their observations and results for others to evaluate and use, developing a statistically robust and representative database describing

fish populations over time. Fishing people also use elements of these scientific methods, usually informally, but their primary reason for doing so is to catch fish. However, since there are many more fishing people than scientists, and they spend a tremendous amount of time on the water, their contribution to science can be very valuable.

Early fishery scientists were well aware of the importance of cooperative research. They learned as much as they could from fishing people who, over many generations, had made millions of observations at sea. One of the best known scientific works about fish of the Northeast region is the book, *Fishes of the Gulf of Maine*, by Henry Bigelow and William Schroeder, published in 1953. The first version of the book was published in 1925, and scientists in the Northeast Fishery Science Center (NEFSC) have just finished revising and updating it for a new edition to be published in the near future. Henry Bigelow and William Schroeder were early Woods Hole scientists who recognized the value of observations by fishing people, which were documented in their book. For example, they wrote:

"We wish to express our hearty thanks to the many commercial fishermen and to the many salt water anglers of our acquaintance who have met our inquires in the most cordial way and who have supplied us with a vast amount of first-hand information on the habits, distribution, and abundance of the commercial and game fishes, which could be had from no other source. The preparation of this book would have been out of the question without their help."

In an attempt to convey the abundance of skates, Bigelow and Schroeder wrote:

"Again, on a trip to the northeastern part of the bank, September 1929, on the otter trawler *Kingfisher*, 37 hauls yielded from 0 to 105 skates per haul (total 459) and 42 trawl hauls by the *Eugene H*, fishing from Nantucket Lightship to the south-central part of Georges Bank in late June 1951 caught an average of 146 skates per haul (total, 6,130 skates) which works out at about 9 to 10 skates per acre."

Fishes of the Gulf of Maine is about the natural history of fish, a key consideration in sustainable fisheries management. However, fishery management also requires stock assessments that track change in fish populations and forecast abundance. One of the first stock assessments was for Georges Bank haddock. As early as the 1920s and 1930s, Woods Hole scientists recognized the importance of systematically documenting observations made from fishing vessels for use in assessments. They established what was known as a "study fleet" of vessels from the once mighty Boston haddock fleet. The study fleet was made up of selected fishing people who agreed to cooperate with scientists so that their catch rates and related observations could be tracked over time. The spirit of cooperation was very strong, as indicated by a letter written in 1933 by the Captain of the fishing vessel *Breeze*, who wrote "...let us know if you would like any further information, and if our present data is proving of any interest. It certainly takes up some of my dead time, which is a great help to me."

Cooperative research between NMFS scientists and the fishing industry has been alive and well throughout the 130 years of history of federal marine fisheries science. However, it has recently received increased emphasis. In the Northeast Region, a very successful cooperative survey of surfclams in the late 1990s marked the beginning of this new era of cooperative research. The cooperative survey of surfclams followed an unsuccessful legal challenge to the NMFS stock assessment of surfclams. The cooperative survey clearly demonstrated that cooperation between NMFS scientists and the fishing industry was much more productive for everyone than was a confrontation. I will provide additional information regarding cooperative research on surfclams later in my testimony.

Reasons Why Cooperative Research is Valuable

The cornerstone of stock assessments in the Northeast region is long-term standardized resource surveys conducted by NOAA fishery research vessels. The Northeast Fishery Science Center has conducted these surveys since the early 1960s. Since then, the approach has been emulated around the world. The primary purpose of the surveys is to track changes in marine ecosystems, including fishery resource species, over time. Long time-series of information on trends in marine ecosystems are a key to sound, scientifically based stewardship, including fisheries management. The importance of long-term standardized surveys was again emphasized in discussions among the world's leading fishery scientists a few weeks ago at a conference sponsored by the new University of Miami Center for Sustainable Fisheries.

Let me emphasize that I do not believe cooperative research can be an alternative to, or substitute for, long-term standardized resource surveys conducted by research vessels. Fishing vessels are not designed or equipped for long-term standardized surveys over vast areas, where numerous ecosystem variables are measured simultaneously. It is also my experience that the fishing industry's interest in cooperative research is generally focused on specific issues that are of current concern. However, cooperative research can still make valuable and unique contributions to the science underlying fishery management. In particular, cooperative research can: (a) be used to increase the precision and expand the scope of resource surveys; (b) provide supplemental information about fishing operations; (c) use the knowledge gained from fishing to help design and implement research; and (d) build mutual understanding and respect among scientists and fishing people.

Increasing the precision and expanding the scope of resource surveys: Resource surveys conducted on board NOAA research vessels cover virtually the entire continental shelf from a depth of 15 meters to 200 meters. This is an area of more than 200,000 square miles. Hundreds of species are sampled and many ecosystem variables are measured simultaneously. By necessity, there is a compromise between the comprehensiveness of the surveys (in terms of area and species covered, and ecosystem variables measured) and precision of information for any specific species and geographic location. At any point in time, it is likely that fishery managers will want more precise information for a particular species in a specific geographic area than can be provided by our broad, multipurpose, ecosystem surveys. However, management priorities change over time, which highlights the importance of maintaining long-term, multipurpose surveys. Cooperative research is potentially a powerful way to fill short-term information gaps without sacrificing the long-term benefits of our multipurpose surveys.

While the Northeast Fisheries Science Center's surveys cover a large geographic region, there are still some important geographical regions that we do not survey, such as some inshore waters. In Massachusetts, we cooperate with the state to survey these waters. Other states conduct surveys on their own research vessels. Cooperative research with the fishing industry is another option for gaining valuable resource survey information inshore, which is an approach being pursued in Maine.

In recent years, fisheries have been expanding to waters deeper than those surveyed by the NEFSC. Cooperative research with the fishing industry can fill this information gap, as was the case with the cooperative monkfish survey. I will discuss this project again later in my testimony. Dr. Anne Richards from the NEFSC is also a member of this panel, and she will provide you with additional information about the monkfish cooperative research from her perspective as a participant.

Providing supplemental information about fishing operations: Most fishing vessels in the Northeast Region (and throughout the country) are required to submit logbooks containing data that describe their fishing

operations and what they catch. While information gathered through logbooks is potentially valuable, it also has many shortcomings. It is difficult to judge its accuracy. It is not practical to collect data on a fine spatial scale, such as the catch at each geographic position where fishing takes place (that is, it would be burdensome to require such data from all vessels). We use scientific observers as an alternative way of collecting high- quality information about at-sea activities. While an observer program is an excellent approach, its high cost limits the number of fishing trips that can be observed.

Cooperative research can be a good compromise for data collection: more precise than logbooks, and less costly than scientific observers. Cooperative projects can also collect biological samples from the fish that are landed. These samples can be used to track changes in stock composition, such things as age composition and growth rates. In the Northeast region, we are reviving the idea of study fleets, such as those used in the earliest haddock assessments. The approach is to identify those people in the fishery who are interested in participating, who will provide more and better data than what is presently gathered in logbooks. Since it is in everyone's best interest to improve the scientific basis of fisheries management decisions, the cooperators can be motivated to work together to design a data collection and transfer system that is both practical for fishermen and useful for science. Fishing industry participants should be provided with the needed training and tools (for example, computer software to record observations) to be effective collaborators. They should remain engaged throughout the process, from planning to the final interpretation of results. I will say more about current efforts to establish modern study fleets later in my testimony.

Using the knowledge gained from fishing to help design and implement research: The fishing industry has valuable knowledge and experience that can make the difference between success and failure for some types of research. In particular, research on fish migrations and on the performance of fishing gear can benefit from a cooperative approach. Successful fishing requires knowledge about fish migrations (fishing vessels try to anticipate and follow migrations). Scientists and managers want to take more information about migrations into account when defining boundaries between management units, or when designing area closures to conserve fish. Cooperative tagging studies with the fishing industry have the potential to provide such information.

Bycatch that leads to wasteful discarding is one of the most perplexing problems facing the fishing industry and fishery managers. One potential solution to the problem is conservation engineering: designing fishing gear that is selective for target species and results in less bycatch. Since the people who make a living by catching fish are the experts on the performance of fishing gear, it is our belief that cooperative research is the only way to be successful in conservation engineering.

Building mutual understanding and respect among scientists and fishing people: I cannot overstate the value of cooperative research as a vehicle for sharing knowledge and building mutual understanding and respect. When people work together on a problem that they both want to solve, they learn from one another and get to know each other. Our overwhelming experience has been that people working together learn to understand each other's perspectives, regardless of personal backgrounds. Owing to this, I believe those who participate in cooperative research will be more responsible in fisheries and fisheries management for the rest of their careers, regardless of their roles.

Examples of Cooperative Research

In the Northeast Region, there are four ways in which cooperative research is planned and implemented. I refer to these as: (1) bottom up planning among scientists and the fishing industry, (2) the Research Partners Program, (3) New England Consortium Cooperative Research, and (4) the Research Set Aside Program of

the Mid-Atlantic Fishery Management Council. The amount of cooperative research activity in the Northeast region is too extensive for me to do it justice in my testimony, but I will try to give you a brief introduction.

Bottom up planning among scientists and the fishing industry: There are several important examples of the fishing industry, NOAA Fisheries scientists, and academic scientists taking the initiative to plan and implement cooperative research to fulfill their mutual desire for more scientific information to help solve a fishery management problem. I will briefly describe some of these examples.

In the late 1990s, neither NMFS scientists nor the fishing industry was satisfied with the surfclam assessment. The problem was an inconsistency between the results from two consecutive NMFS surveys of surfclams in the mid-Atlantic area. The fishing industry proposed using their vessels in a cooperative research study to investigate the inconsistency. The critical research objective was to estimate the efficiency of the hydraulic clam dredges used to survey the resource. An innovative experiment was designed and implemented. High intensity "depletion studies" conducted by fishing vessels were embedded within a standardized resource survey conducted by a NOAA research vessel. These depletion studies measured dredge efficiency by tracking the rate of decline in the catch rate when fishing tows were repeated in a very small area (as small as modern electronic navigation would allow.) The more rapidly the catch rate declined, the more efficient the hydraulic dredge must be. The actual estimates of efficiency were made using a sophisticated statistical model that was developed specifically for this cooperative research study. In addition to scientists from the NEFSC center, Rutgers University scientists participated in the study. The results of the study were submitted to the Stock Assessment Review Committee (SARC) used by the Northeast region to peer-review stock assessments and prepare fishery management advice. Results of cooperative research in the Northeast region (including the sea scallop and monkfish cooperative research discussed next) are routinely submitted to the SARC for review before they are used as the basis for fishery management advice. In the end, there was a new assessment of surfclams in which both the fishing industry and scientists were confident. The assessment showed that the surfclam resource was healthy, and a small increase in the total allowable catch resulted.

Following the success of cooperative research on surfclams, the scallop fishing industry and scientists from the University of Massachusetts proposed a survey to estimate the abundance of sea scallops inside groundfish closed areas off New England. NEFSC surveys showed that the resource had rapidly rebuilt inside the areas on Georges Bank and Nantucket Shoals that were closed to groundfish and scallop gear in 1994. However, before scallopers could be allowed access to these valuable sea scallop beds, more detailed information was necessary to devise how, when, where, and for how long an opening could occur. First, an estimate of actual biomass was required, as well as information on the size composition and spatial distribution of sea scallops. This would establish how much could be removed from the stock without overfishing. Next, there needed to be an estimate of groundfish bycatch that would occur during scalloping and an understanding of where the sea scallops were distributed relative to essential fish habitat and habitat of critical concern in the closed areas. This would establish where and when the scallop fishery could occur. Finally, there needed to be an estimate of dredge efficiency-this would govern how long an opening was likely to last.

In the summer of 1999, NEFSC scientists, the scallopers, and academic scientists from Rutgers University, the Virginia Institute of Marine Sciences, and the University of Massachusetts designed and implemented a cooperative survey of sea scallops in one of the Georges Bank closed areas. The survey provided the most intense sampling of the area to date. The same type of depletion studies that were successful for surfclams were conducted as part of the sea scallop cooperative research program. All of the scientific objectives of the cooperative research were fulfilled. As a result of this work, managers devised a controlled sea scallop

opening in a portion of the surveyed closed area, one that prevented overfishing, avoided impact on habitat of particular concern, and limited bycatch so that groundfish stock rebuilding was not jeopardized.

Similar cooperative sea scallop surveys in other groundfish closed areas were conducted in the summer of 2000, and additional controlled sea scallop openings in these areas were allowed. As a result, the industry gained tens of millions of dollars of additional revenues, while the sea scallop resource has continued to rebuild to unprecedented abundance. In 2000, New Bedford had the highest gross earnings of any port in the United States, largely from sea scallops. Many people attribute the remarkable turnaround in the fortunes of the scallop industry to cooperative research.

Our most recent experience with cooperative research concerns monkfish. Until recently, the monkfish were of minor economic importance and most of the catch was not well documented. Owing to development of an international market, however, the monkfish fishery has become one of the most valuable finfish fisheries in the region. Poor documentation of the historical catch made it difficult to interpret standardized resource survey data by using the usual stock assessment methods. In addition, resource survey coverage was sparse in the deep water on the edge of the continental shelf, an area where part of the monkfish fleet routinely fishes. As a result of shortcomings in other data, the assessment was heavily influenced by the rapid decrease in the size of monkfish taken in resource surveys, raising concern about whether the multipurpose standardized fishing gear used in the federal survey was suited to catching large monkfish. The present management plan calls for severe restrictions in the near future in order to rebuild the stock, so there was plenty of incentive to cooperate on improving the assessment to provide a clearer picture of stock status. NEFSC scientists worked with the fishing industry to design and implement a pilot survey on a commercial fishing vessel in 2000, and a comprehensive survey was conducted this year. The SARC just completed its review of the results, and found the cooperative survey data useful and informative. Specifically, the results helped the panel to more precisely assess the current status of the monkfish stocks. I will leave it to Dr. Anne Richards, who had first hand experience with the monkfish cooperative research, to tell you more about it.

Cooperative research surveys of surfclams, sea scallops in groundfish closed areas, and monkfish are examples of cooperative research that has received the most attention, probably because the research responded to controversial fishery management problems. However, NEFSC scientists and the fishing industry have been, or are, involved in several other cooperative research efforts. For example, there is an ongoing cooperative research effort to develop acoustic survey methods for sea herring; scientists from the State of Maine's fisheries agency also participate. NEFSC scientists worked with Rutgers University scientists and the fishing industry to study the feasibility of "real time" fishery management of the *Illex* squid fishery. NEFSC scientists are currently working with the fishing industry to study the feeding habits of cod, in order to gain a better understanding of where this important species fits in the marine food web. A physical oceanographer from the NEFSC is working with the lobster fishing industry to deploy environmental sensors on lobster pots. The cooperative shark tagging program has been conducted by the NEFSC with anglers and commercial fishermen since 1962, resulting in the world's largest database on movements of Atlantic sharks. All of these cooperative research projects provide valuable information and build mutual respect and understanding.

Research Partners Program: This program is administered by the Northeast Regional Office of the National Marine Fisheries Service. The other partners are the New England Fishery Management Council, state agencies responsible for marine fisheries, the fishing industry, academic and private marine science organizations, and the NEFSC. The program is supported by more than $25 million that Congress has made available to support cooperative research related activity in New England since fiscal year 1999.

The New England Fishery Management Council established a Research Steering Committee to develop an overall strategy for cooperative research, set priorities, and recommend specific cooperative research projects for funding. The Research Steering Committee has14 members including fishery council members and staff, NMFS staff, fishing industry representatives, environmentalists, a representative of a state fisheries agency, and scientists. So far, 18 cooperative research projects have been reviewed and recommended for funding by the Research Steering Committee. These projects include:

- •a task force for cod tagging;
- •a task force for bycatch reduction research;
- •a task force for study fleets and industry-based surveys;
- •research on the stock structure of silver hake;
- •gear selectivity and bycatch reduction for silver hake fishing;
- •shrimp fishing gear selectivity and bycatch reduction;
- •industry-based inshore survey in Maine;
- •high resolution industry-based survey by New Bedford fishing vessels;
- •a study of the impact of mobile fishing gear on smooth bottom habitat;
- •design of an internet-based logbook;
- •planning for a monkfish gillnet survey and study fleet; and
- •consideration of the potential bycatch of cod and haddock in a groundfish closed area fishery for yellowtail flounder.

All of these projects are considered short term. In addition, the Research Partners Program intends to support long-term programs for study fleets, industry-based surveys, and fish tagging. Planning for study fleets is the most advanced of these long-term programs.

A Steering Committee, made up of scientists, fishing people, representatives of the New England Fishery Management Council, and NMFS staff is driving the development of a groundfish study fleet that will use modern technology to collect, record, and transfer fishery-based data. At a workshop in October of this year, the committee and others assessed the current state-of-the-art in electronic data capture systems and the use of selected industry vessels for the collection of high quality fishery-based data. The results of this workshop documented the state of such projects throughout the United States and in the Canadian Maritime provinces. The Steering Committee is now developing three pilot projects to test the feasibility of an electronic data collection system (using vessel tracking and other technologies to capture timely, high quality data for use in stock assessments and fishery management). They intend to begin preliminary data collection in Spring 2002.

Northeast Consortium Cooperative Research: In addition to providing funding for the Research Partners Program administered by the Northeast Regional Office, Congress has provided $12 million, beginning in fiscal year 1999, for cooperative research to be administered by the Northeast Consortium. Several years ago, a group of fishing people and academic scientists began working together to plan and conduct research on a relatively small scale. When Congress provided funding, the Consortium was formalized among the University of New Hampshire, University of Maine, Massachusetts Institute of Technology, and the Woods Hole Oceanographic Institution. A 25-member steering committee of scientists (including some from the NEFSC) and fishing people was established to recommend projects for funding by the Consortium. The Consortium encourages fishing vessels primarily from Maine, New Hampshire, and Massachusetts to conduct cooperative research in the Gulf of Maine or on Georges Bank. The Steering Committee established the following priority areas for cooperative research:

- •selective fishing gear research and development;
- •evaluation of closed areas and closed area management systems;
- •fish habitat;
- •commercial harvest and species sampling; and
- •oceanographic and meteorological monitoring .

Sample topics from the 29 projects funded so far by the New England Consortium include:

- •selectivity of demersal hook fishing;
- •movements of groundfish in closed areas;
- •cod bycatch reduction in a flounder fishery;
- •an inshore trawl survey in the Gulf of Maine;
- •testing low profile gillnets to reduce cod bycatch;
- •outreach and education in support of cooperative research;
- •effects of using herring for bait on the growth rate of lobsters;
- •comparison of environmental contaminants on Georges Bank and Stellwagen Bank;
- •fishing vessel surveys of coastal herring aggregations; and
- •development of stock assessment methods for the deep-sea red crab fishery.

Research Set Aside Program of the Mid-Atlantic Fishery Management Council: To date, most of the funds Congress has provided to support cooperative research have been directed toward New England. However, the Mid-Atlantic Fishery Management Council and the fishing industry in the Council's area of responsibility also recognize the need for more research. Therefore, the Council established an innovative way to encourage and support cooperative research. It is referred to as the Research Set Aside Program.

The Research Set Aside Program allows up to 3% of the total allowable catch of summer flounder, scup, black sea bass, Atlantic mackerel, *Loligo* and *Illex* squid, butterfish, tilefish and bluefish to be set aside as compensation for research. The program was established through a Framework action effective 10 August 2001. For the 2002 fishing year, the Council recommended a 2% set aside for summer flounder, bluefish, *Loligo* and *Illex* squid, mackerel, and butterfish; and a 3% set aside for scup, black sea bass, and tilefish.

The Council set the following priorities for the first year of the program:

- •bycatch and discard reduction concerning the summer flounder, *Loligo* squid, and scup fisheries;
- •mesh and gear selectivity for summer flounder, scup, squid, and black sea bass;
- •fishing impacts on habitat;
- •cooperative stock assessment surveys focusing on summer flounder and acoustical methods for mackerel; and
- •improved recreational fishery data focusing on enhancing overall knowledge of recreational fisheries and evaluating the effectiveness of recreational management measures and/or data collection.

A call for proposals to respond to the research priorities was published in the *Federal Register*. Thirteen proposals were received and reviewed by a panel, including members of the Council's Comprehensive Management Committee. Successful proposals should be authorized to begin by early 2002.

Success Factors for Cooperative Research

To realize its full potential, I believe cooperative research must be:

- •collaborative throughout, involving scientists and fishing people in defining objectives, planning research, implementing research, and analyzing results;
- •conducted by both scientists and fishing people with open-mindedness, a willingness to compromise (that is, participants should not expect to do business as usual), and accept that their previous views might be incorrect;
- •pursued with realistic expectations. For example, it must be understood that an assessment that depends on a time-series of relative abundance data cannot be replaced by a single collaborative survey
- •subjected to the same degree of peer review as other research that supports fishery management decisions (for example, by the Stock Assessment Review Committee);
- •supported by adequate financial and personnel resources to plan and conduct cooperative research without diverting resources from ongoing scientific programs, such as the long- term standardized resource surveys conducted by NOAA research vessels; and
- •able to provide immediate feedback to participants, who then have easy access (such as on web sites) to the data they provided or helped to collect, so they can see how it is being used to help inform fishery management decisions.

I would like to conclude my testimony by stressing that I think there is great potential for cooperative research to make valuable contributions to fisheries management in the Northeast. There is a strong commitment to cooperative research by NMFS scientists and managers, and by the fishing industry. There are already cooperative research successes upon which future successes can be built. Congress has provided funds to support cooperative research. Fishery Management Councils are actively engaged in planning cooperative research and applying innovative approaches for supporting it. State agencies and many non-federal scientists (e.g., academics) are also enthusiastic about cooperative research. While we should not lose sight of the importance of the success factors I listed above, I am optimistic about the future.

Mr. Chairman, this concludes my testimony. I would be happy to answer any question you or other members of the Subcommittee might have.

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